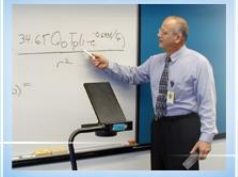
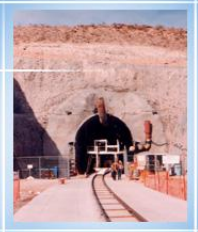




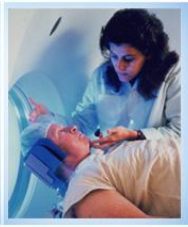


Brian W. Sheron, Director
Office of Nuclear Regulatory Research

Blue Ribbon Commission on America's Nuclear Future
August 31, 2010

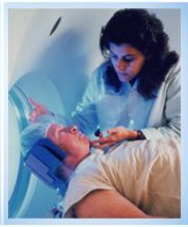




DOE, NRC, and Industry Roles

- DOE and Industry
  - Develop new technologies and test proposals
  - Submit new proposals with design bases and sufficient data to demonstrate safety
- NRC
  - Establishes regulatory requirements to ensure safety of nuclear facilities (e.g. nuclear power plants, fuel facilities) during construction, operations, and maintenance
  - Performs reviews and inspections to ensure compliance with regulatory requirements
  - Conducts research to support regulatory functions



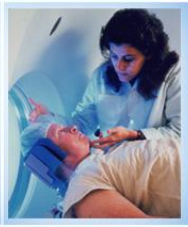


NRC's Office of Nuclear Regulatory Research (RES)

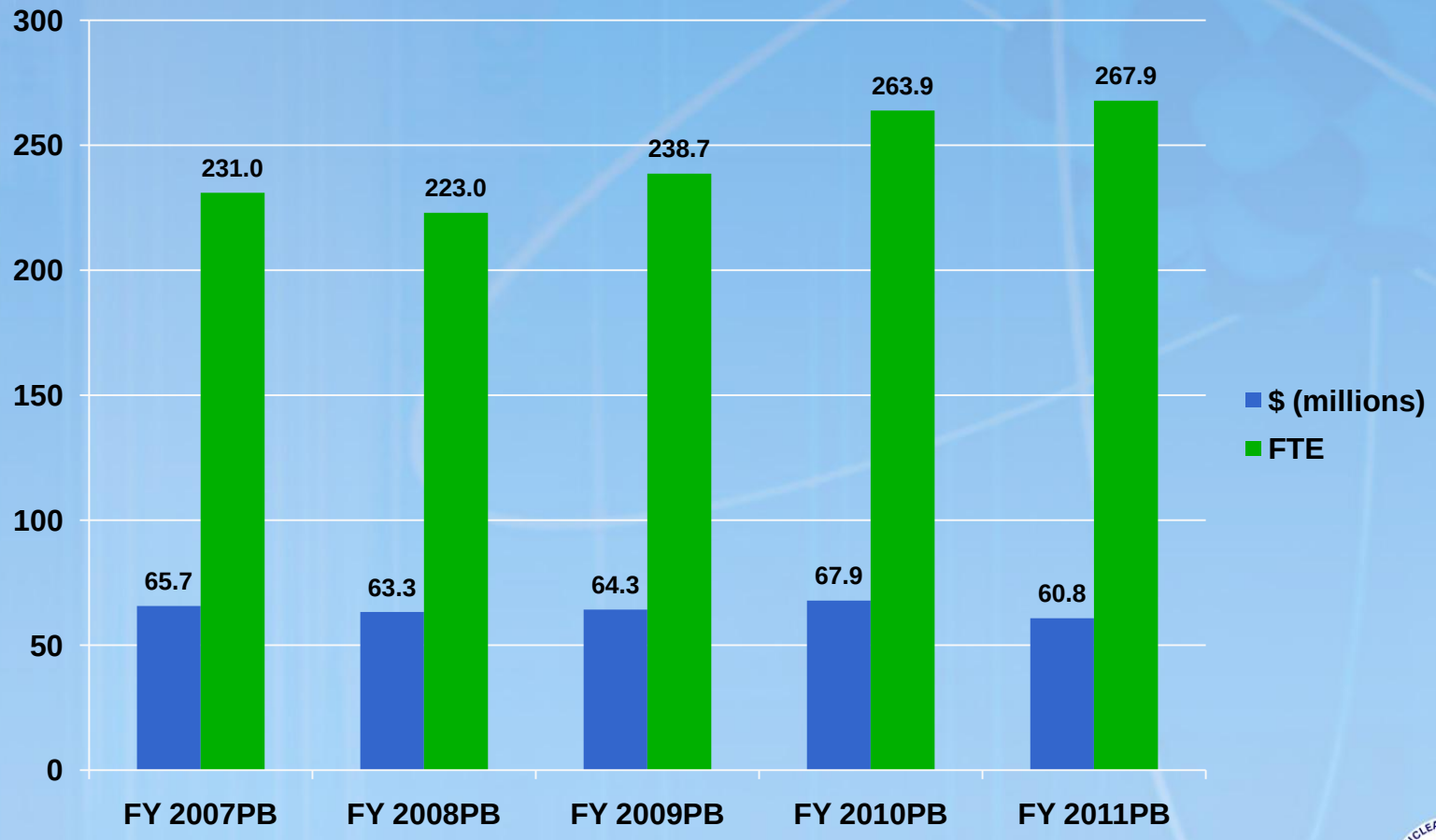
Who We Are:

- Major NRC program office
- Mandated by Congress
- About 260 staff, >$68M funding
- Engineers, scientists, analysts

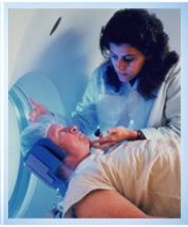




RES Resources FY2007 – FY 2011

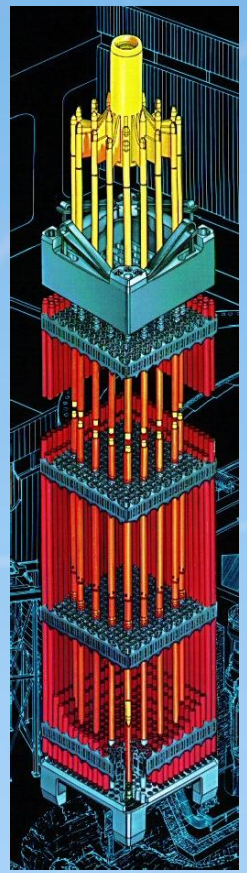






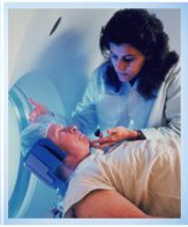
Principal Areas of Research

- New and advanced reactors infrastructure development
- Thermal-hydraulics, severe accidents, reactor physics, and safety analyses
- Materials science
- Fire Protection
- Nuclear fuel behavior under accident conditions
- Digital I&C and Electrical Engineering



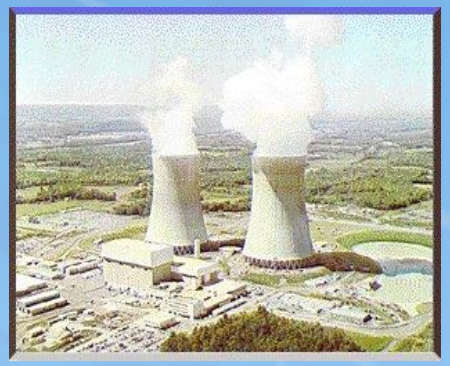
- Health physics
- Probabilistic risk assessment (PRA)
- Accident Sequence Precursor analyses
- Analysis of Operating Events
- Environmental transport
- Human Factors and Reliability
- Seismic & Structural Engineering

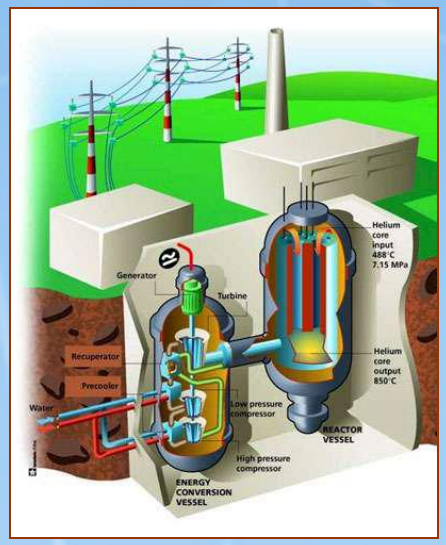




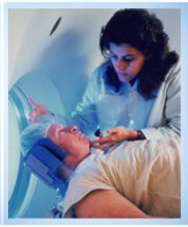
How RES Supports License Reviews

- Applications must:
  - be complete and of high quality
  - demonstrate compliance with regulatory requirements
  - NRC research supports licensing reviews by:
  - developing analytical models
  - confirming applicants' safety analyses
  - conducting tests as necessary to independently confirm applicants' design
  - identifying gaps where there is a need for new regulatory infrastructure





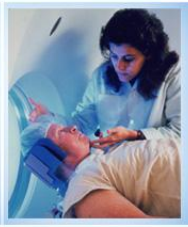




Technology Neutral Risk-Informed/ Performance-Based Regulatory Framework

- Generic regulatory requirements are set by the Atomic Energy Act (AEA) and its amendment
- Technology neutral = independent of the nuclear technology (reactor design, coolant medium)
- Technology neutral regulatory framework would require design specific regulatory guidance to ensure AEA requirements are met.

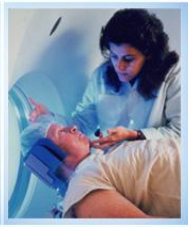




Feasibility Study for a Risk-Informed and Performance-Based Regulatory Structure for Future Plant Licensing

- NUREG-1860 issued December 2007
  - Use of a probabilistic (risk-informed) approach in identification and selection of licensing basis events Safety classification of SSCs
  - Explicit consideration of defense-in-depth
  - Based on and interfaces with other parts of 10CFR to utilize existing requirements
  - Regulatory guidance supplements performance-based regulations
- Framework will be pilot tested with NGNP

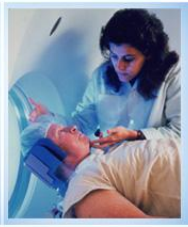




Summary

- Technology neutral framework requires NRC to develop design specific regulatory guidance
- Regulatory guidance developed for most probable industry design concepts that we expect to regulate domestically
- Industry must provide detailed technical information and data to allow NRC to develop regulatory infrastructure
- Licensing can be simplified if proposals do not push the "envelope"

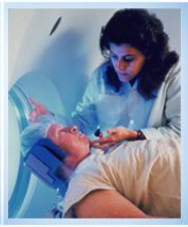




Concluding Remarks

- Industry needs to conduct the majority of research in support of new nuclear technology
- NRC will continue to cooperate with industry to identify most probable future technologies to develop regulatory framework





References

- RES Web site:
  http://www.nrc.gov/about-nrc/organization/resfuncdesc.html
- NUREG-1925 “Research Activities 2009”
  http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1925
- NUREG-1860 “Feasibility Study for a Risk-Informed and Performance-Based Regulatory Structure for Future Plant Licensing ”
  http://www.nrc.gov/reading-rm/doc-collections/nuregs/staff/sr1860